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Gas Bag Module

The present invention relates to a gas bag module.

Gas bag modules are known which comprise a gas bag with a gas bag wall having a front wall serving as an impact surface for an occupant, where, in an inflated state of said gas bag, the front wall has a centric orifice as a transition to an indentation. The indentation is formed by restraining a center section during inflation and preventing the center section of the gas bag wall from moving freely.

A gas bag shaped in such a manner offers a more comfortable restraining effect for the vehicle occupant than a conventional balloon-shaped gas bag, since the substantially annular restraint chamber effects a more gentle support of the vehicle occupant in a combined action with the non-inflated indentation (the orifice of which is of course designed such that the head of the vehicle occupant cannot come into contact with any vehicle parts). However, elaborate cuts are necessary to give the gas bag the desired shape in the inflated state, which results in high manufacturing expense.

It is an object of the invention to simplify the shaping of a gas bag for such a gas bag module.

This is achieved in a gas bag module comprising a gas bag with a gas bag wall having a front wall serving as an impact surface for an occupant, where, in an inflated state of said gas bag, the front wall has a centric orifice as a transition to an indentation. The indentation is formed by restraining a center section of said gas bag wall during inflation and preventing the center section from moving freely. The orifice is surrounded by a stabilizer defined by a closed ring in a region of the orifice, the stabilizer being a part separate from the gas bag wall. The stabilizer directly determines the size of the orifice and by its arrangement also the

depth of the inflated gas bag. The size, the cross section and the diameter of the orifice are determined in the manufacture of the gas bag module on the basis of the shape and the arrangement of the stabilizer. The stabilizer is extending around the orifice in a circumferentially closed manner, i.e. it does not extend inside the
5 gas bag.

The elasticity of the stabilizer can be very low so that the diameter of the orifice can be defined exactly.

Preferably, the stabilizer is a band or a fabric ring, however, it can also be formed by a cord or be another suitable, circumferentially closed, annular object.

10 In a preferred embodiment of the invention the stabilizer is arranged in a channel formed at the front wall. The channel can for example be formed by a fabric strip which annularly surrounds the orifice and is secured to the front wall of the gas bag. Preferably, the stabilizer is displaceable relative to the wall of the channel. Thus, the stabilizer can be arranged safely and accurately as regards its
15 position. Since the stabilizer lies loosely in the channel, the stress exerted on the stabilizer and the channel can be distributed uniformly upon deployment of the gas bag and upon impact of the vehicle occupant.

The gas bag module is provided with a cover in a known manner, which partly opens during deployment of the gas bag to release the gas bag. Preferably, the
20 cover has a centric section, e.g. an emblem, which is stationary upon bursting of the cover and the position of which relative to the gas bag module does not vary upon the emergence of the gas bag. The stabilizer and the stationary section of the cover can be coordinated with each other in such a manner that in a folded state of the gas bag the stabilizer surrounds the stationary section of the cover and during
25 deployment is moved outwards along the stationary section. If both components are circular, this means that the diameter of the stabilizer has to be at least the same or slightly larger than the diameter of the stationary section so that the stabilizer can concentrically surround the stationary section. If the shape of the stationary section or the stabilizer deviates from the circular form, the shapes and

the sizes will have to be adapted accordingly. During deployment of the gas bag the front wall of the gas bag with the stabilizer lifts off without being obstructed by the stationary section of the cover.

5 The invention also offers the advantage that the indentation can be confined by a wall section integrally connected to the front wall, thereby reducing the number of the fabric sections required for the production of the gas bag. In principle, the entire front wall of the gas bag can be manufactured of a single flat piece of fabric. In this arrangement the center section of the front wall can be constricted by the stabilizer at a suitable, predetermined location so that an indentation having
10 the desired diameter and depth is provided.

 The front wall of the gas bag can be connected to a rear wall of the gas bag in a known manner via at least one limiting strap which co-determines the shape of the gas bag in the inflated state. The limiting strap or straps can also be secured to other components of the gas bag module.

15 Further features and advantages of the invention will be apparent from the following description of an exemplary embodiment in conjunction with the accompanying drawing. The single figure shows a schematic cross section through a gas bag module in accordance with the invention comprising a gas bag in a partly inflated state.

20 The gas bag module 10 shown has a gas bag 12 which is defined by a gas bag wall which among other things comprises a front wall 14 and a rear wall 16. Inserted into the inside of the gas bag 12 through an inflation mouth 18 are a compressed gas source, e.g. a known pot-shaped gas generator 20, and a diffuser 22 surrounding the gas generator. The diffuser 22 can also be a cage or a similar
25 component. The gas generator 20, the diffuser 22 and the rear wall 16 of the gas bag 12 are connected to each other in a conventional, known manner. An outflow opening 23 is provided in the rear wall 16 of the gas bag 12, through which gas can escape from the gas bag 12 upon the impact of the vehicle occupant on the gas bag 12.

In the inflated state the front wall 14 of the gas bag 12 has a centric opening which forms the orifice 30 of a deep indentation 28 at the front end. This indentation 28 is formed in that a center section 24 of the section 29 of the gas bag wall which limits the indentation 28 is prevented from a free or from any movement during deployment of the gas bag 12. For this purpose the center section 24 of the gas bag wall which, in the inflated state of the gas bag, corresponds to the deepest location of the indentation 28, is clamped between the upper side of the diffuser 22 and a centric, stationary section 26 of a cover 25 of the gas bag module 10 (only indicated in the figure). Therefore, during inflation of the gas bag 12 the center section 24 does not move towards a vehicle occupant but is restrained at the diffuser 22. In the inflated state, this imparts a characteristic ring shape to the gas bag 12. The gas bag 12 has a single annular chamber with an indentation 28 formed in the region of the center section 24, which has a preferably open orifice 30 facing the vehicle occupant. Surrounding the orifice 30, the front wall 14 of the gas bag 12 defines an impact surface 32 with which the vehicle occupant comes into contact in the case of an impact.

The orifice 30 is encircled by a stabilizer 30, which forms a closed, continuous ring in the region of the orifice 30. The stabilizer 34 is e.g. a band or a fabric ring, however, it can also be a cord or a rubber band. The stabilizer 30 is received in a channel 38 formed by a fabric strip 36 sewn to the front wall 14 in the region of the orifice 30 and is displaceably arranged relative to the walls of the channel 38. The channel 38 can be completely closed or partly open. The shape, the diameter and the position of the stabilizer 34 determine the shape and the diameter of the orifice 30 as well as the depth of the indentation 28.

In this example the stabilizer 34 has only a very low inherent elasticity so that the diameter of the orifice 30 is not or only insignificantly enlarged upon the impact of a vehicle occupant.

The shape and the diameter of the stabilizer 34 are adapted to the shape and the diameter of the stationary section 26 of the cover 25 such that in the folded state of the gas bag the stabilizer 34 surrounds the stationary section 26 (shown in

broken lines). The stabilizer 34 rests on the upper side of the diffuser 22 together with a part of the folded gas bag 12. During deployment of the gas bag in the case of an inflation of the gas bag 12 by the gas generator 20 the movable sections of the cover 25 open and the stabilizer 34 moves in the exit direction of the gas bag
5 12 along the stationary section 26 of the cover 25 outwards and towards the vehicle occupant.

In the example shown, the indentation 28 is confined by a section 29 of the gas bag wall integrally connected to the front wall 14, i.e. the front wall 14 and the section 29 are formed by one piece of fabric which was turned in the center
10 toward the inside through the stabilizer 14 to form the indentation. The shape and the depth of the indentation 28 are determined here only by the shape and the position of the stabilizer 34. On account of the configuration of the indentation 28 as a one-piece part with the front wall 14 the cutting and sewing expenditure is reduced compared with a gas bag composed of ring segments. However, the
15 invention can also be implemented in other gas bag designs.

In the gas bag module shown, the shape of the inflated gas bag 12 is additionally determined by limiting straps 40 which extend between the front and rear walls 14, 16 of the gas bag 12 and are additionally connected to the center section 24 of the front wall 14. However, the invention is completely independent
20 of the use of limiting straps.